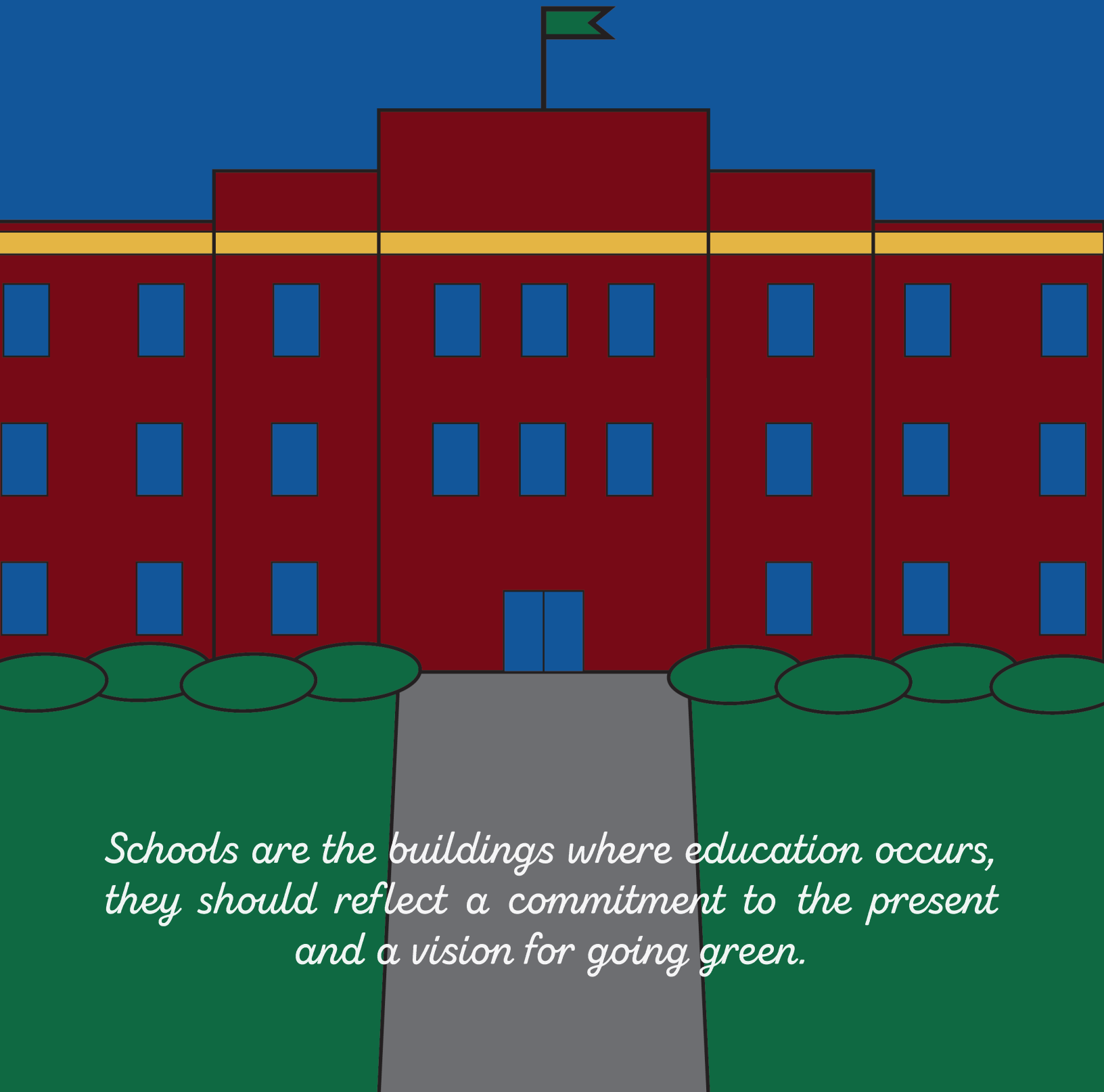


Your Building as a Teaching Tool



*Schools are the buildings where education occurs,
they should reflect a commitment to the present
and a vision for going green.*

Managing budgets, completing state reports and certifying payroll are just a few of the major responsibilities for a chief school business official. However, one responsibility that is often overlooked is that of the role CSBOs play as construction managers for their districts. Usually, CSBOs are more concerned with budgets and timelines; however, now more than ever, we should pay closer attention to how we approach choices related to how our schools are built. At Adlai E. Stevenson HSD 125, we are committed to renovating and building our school to reflect what we are teaching students so our students can learn from how our school is constructed. For us, how our school is built is a tool in the educational process, inspiring a commitment to renewable energy, sustainability and our environment. Schools are the buildings where education occurs; they should reflect a commitment to the present and a vision for going green. Plus, students can learn a great deal from the choices that go into how we approach the architecture and construction of a school building.

Laying the Groundwork

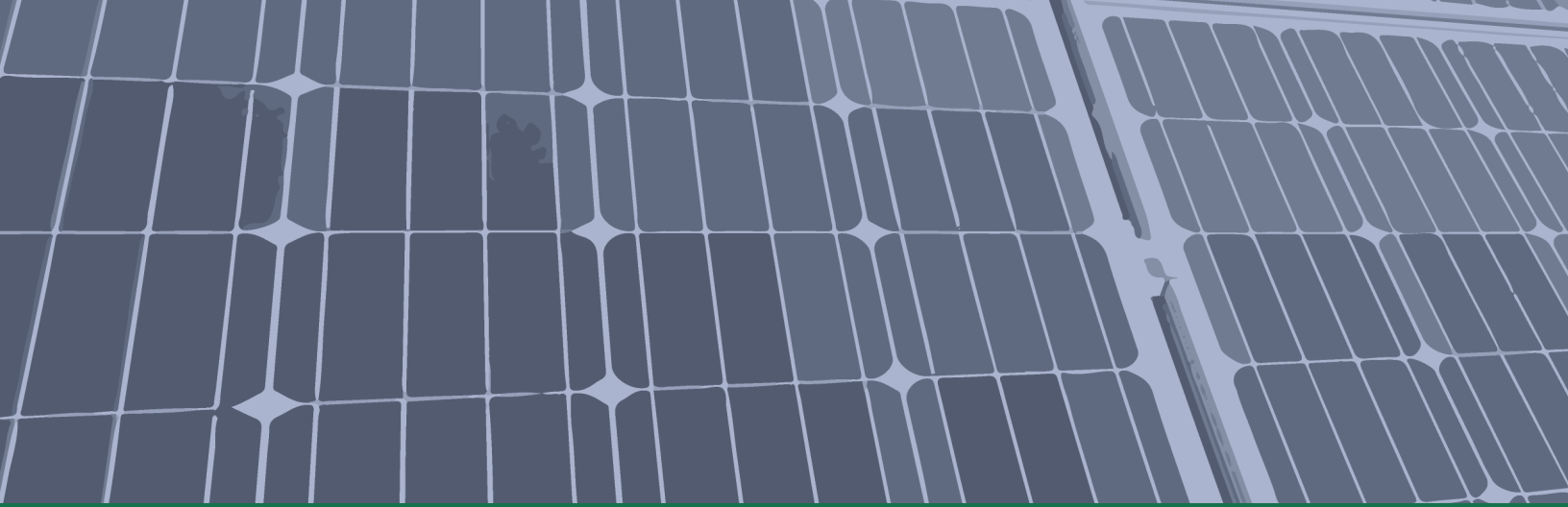
Stevenson High School opened a new addition to their existing East Building in August of 2019. This 58,000 square foot addition is three stories housing 21 teaching spaces, with a full-grow green roof and greenhouse. It contains many different features specifically designed to aid instruction. From the beginning, the district had a desire to build a sustainable building. Having already twice received LEED-EBOM Gold Level certification for the existing building, there was a desire to ensure the new EBA aided in achieving that same standard again in 2020. However, in working with our architects, Wight & Co, we realized an opportunity to go beyond the basics of LEED certification. We had the chance to make our new addition a net zero energy building and a structure created for innovative learning opportunities. Furthermore, we had the opportunity to receive a grant from the Illinois Clean Energy Foundation (<https://www.illinoiscleanenergy.org/>), a grant dedicated to making sustainable, thoughtful construction choices for the environment.

The Clean Energy Foundation is a resource for school districts, local governments and other non-profit organizations that offer funds for projects that advance the development of renewable energy sources and energy efficiency. For our efforts, the Net-Zero Energy Building Program Grant secured by Stevenson was designed to provide up to 60 percent of the cost of construction with a cap of \$1 million dollars. In our work, the grant offset the purchase and installation of our entire solar array (480 kw), the key component in ensuring we achieve net zero.

(Note: the grant now has a cap of \$2 million, and the Foundation also offers other grants for smaller projects such as the addition of just a solar array, wind farm or other sustainable projects.)

Engaging Students

While the grant award was important in the creation of a Net Zero building, it was not the main driver of building our design. Our choices were driven by how we wanted to educate and inspire our students. We wanted to create a building that could also serve as a tool in the classroom. The solar array was one of the main features that connected the building to the classroom. For example, much like a homeowner, our business classes discuss the economic impact of the solar array on our school budget. By investigating the economic impact, students learned how the addition of the solar array helped the district avoid approximately \$60,000 a year in energy costs. Moreover, our Project Lead the Way electrical engineering classes examined the real-life application of turning DC power from the solar array into AC power for use in the classroom. Working with students in “real world ways”—examining and better understanding the very building where they are learning — helped to engage students and gave them the opportunity to recognize the value of architectural choices and innovative changes.



Another key teaching tool of our addition was the full-grow green roof and greenhouse. In working with our teachers, we decided to build a full-grow green roof, instead of a simple green roof tray system — providing our students the ability to study and grow a large variety of produce, herbs and other plants. **Our green roof is organized into two sections:**

1. The farm

Our farm covers two-thirds of the entire roof, approximately 10,000 square feet. In this area we transplant vegetable seedlings, herbs and other edible plants originally planted and cultivated in our greenhouse. Students from our science and special education programs study the growth of these plants from seed planting to harvest, investigating the science of horticulture. Furthermore, our students in the culinary arts courses can cook with fresh produce and herbs from the garden in class, allowing for the comparison/contrast of dried herbs. We are also asking Sodexo, our food service provider, to incorporate many of the different types of produce and edible plants into special “roof to table” entrées.

2. An area for inspiration

Our areas of inspiration, both on the green roof and in the courtyard, were specifically designed for our science, fine arts and special education students. In these areas, science and special education students study the various species of native plants to learn more about different plant life in our local environment. Our fine arts students use the space as a source of inspiration for drawing, painting or the basis of a sculpture. Of course, all of our students can use the courtyard as an outside gathering space amongst all the foliage — a special place for peace, calm and tranquility.

In addition to the horticultural and botany education provided by the farm, we also constructed other educational opportunities for our science, math and architecture classes. There are over 100 different types of sensors both inside and outside of the building in addition to the two weather stations. These sensors collect

a plethora of data. For example, there are temperature sensors on the roof underneath the farm soil as well as temperature sensors on the existing building roof, which is out in the open. Students can now analyze the insulation value of the green roof compared to the R-value of a typical roof. Likewise, energy meters collate the use of energy as well as energy produced. Data like this can all be put into graphs or charts, which provides real-life experiences for students to use reading and interpreting skills. Another authentic example for students is the ability to use the rain sensor data to compare the storm water runoff from two different roof types.

Setting the Scene

Inside the building, we have features that remind students of thought that went into the important design choices of the building. The first, although not always noticeable, is our lighting system. It is undeniable that natural daylight is better for learning than LED or fluorescent lighting, therefore we built window walls on the exterior and interior of the building and we installed light-harvesting sensors and created light scenes in every teaching space — where light scenes are pre-programmed light settings for when use in the classroom. Depending on the activity (projecting inside the classroom, facilitating a lecture, or having students work in groups), the light scene is designed to provide the appropriate amount of light measured by foot candles. Regardless of the scene the light output is below maximum light output reducing the demand for energy. Furthermore, light-harvesting sensors also take advantage of the natural light coming in from the windows. If the sensors measure enough foot-candles of light, the light banks along the window wall (approximately 1/3 of light structures in the classroom), will turn off. These light harvesting sensors are not only in the classroom, but also in the hallways. On most partly sunny and all full sun days, there is enough light flowing into these spaces that the lights don't turn on at all. All of these choices offer learning opportunities that support our commitment to creating curriculum experiences that elevate critical thinking and problem-solving skills.

From Construction to Curriculum

With our approach, construction choices can become choices that can build our curriculum. For instance, our third floor of the new addition features five physics rooms. For each of these classrooms, we specifically collaborated with our science teachers to ensure the most optimal use of the room in the education process. We added power in the ceiling and the floor throughout and a variety of hanging clips (tied into floor deck, 500-pound load) for use with different experiments. Lab table legs also adjust up/down on each side to create inclines/declines as well. Finally, floor tiles were designed with altering color schemes and each color scheme represents exactly two meters. This allows teachers to use the floor as part of lab without having to put tape down on the floor. In addition, we designed our hallways with terrazzo. The terrazzo tiles are also exactly one-meter wide so students can easily conduct friction experiments and witness the different results. We built an overhang from the third floor to the second floor for classes to conduct drop experiments without having to travel outside to the athletic stadium.

Finally, we built two, two-story living walls. As it turns out, this is the feature most students enjoy. These walls, while providing beautiful sight and tranquil sounds, actually perform an important function in energy savings. These living walls are in essence giant furnace filters. Air flows through them, the plants remove air impurities and convert the carbon dioxide to oxygen. This “cleaned” air is recirculated throughout the addition. Because the temperature of the “cleaned air” is already at a desired set point, we do not have to bring in as much, if any, outside air which might be a drastically different temperature than desired for inside the building. There are sensors on both sides of the living walls to measure the indoor air quality prior to and after the filtering of air.

Look Beyond Cost

Many features went into the design and construction of our addition. Of course, two big questions might be of interest:

- 1. Does it all work as designed?**
- 2. How much extra did it cost?**

As of the publishing of this article, we are slightly behind our predicted savings, but we also experienced the cloudiest January on record. In terms of costs, the district received a \$1 million grant from the Illinois Clean Energy Foundation to offset the added costs of creating a sustainable, energy neutral building. While difficult to determine the exact additional cost, our architects and construction manager estimate the cost to be around \$3 million. Thus, the total cost of our project was an additional \$2 million, excluding the \$60,000 annual energy savings.

In the end, whether remodeling a part of your facility or building something completely new, there is an additional factor to creating a sustainable, energy-efficient, environmentally friendly building: the education of students. As we continue to think about our work and the construction of our buildings, we should also factor in the value of authentic, educational opportunities for our students. As you approach your next construction project, take the time to think differently. Consider the impact advancements in architectural design and construction can create on student learning, think about the process of design as a chance to bring teachers to the table and work to create a building that is not only environmentally responsible, but also a building your students can study as part of the curriculum. Your school building can be a teaching tool, not just a budget item.

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